SCIENCE.

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MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison on Hudson, N. Y.
Subscriptions and advertisements should be sent to SCIENCE, 41 N. Queen St., Lancaster, Pa., or 41 East 49th St., New York.

CURRENT NOTES ON PHYSIOGRAPHY (VI.).

SURFACE CURRENTS OF THE GREAT LAKES.

A REVISED edition of the atlas of 'Surface Currents of the Great Lakes,' as deduced from the movements of bottle papers during the seasons of 1892, 1893 and 1894, by Professor M. W. Harrington, has lately been issued as Bulletin B of the Weather Bureau. The text describes the method of study, and gives tables of the prevailing winds of the lake-port stations and a list of recovered bottles, 672 being found out of nearly 5000 floated. The chief drifts are: eastward along the south side of Superior, westward along the north side; south along the west side of Michigan and Huron, north along the east side; generally eastward in Erie and Ontario. Many irregular movements are noted, especially near shore. Local and transient currents, formed during severe gales, are sometimes strong enough to drag vessels from their moorings. "There also occurs, occasionally, on the Great Lakes a phenomenon which may be called a *seiche*, namely, a wave of considerable height which travels unaccompanied by other waves, and is seen by navigators as a white wall approaching and rapidly passing them." Following the use of the term *seiche* on the Swiss lakes, where it originated, it would be more properly applied to the rise and fall of the water on the shore, in periods of generally less than an hour; these being well known at our Lake ports, but as yet very little studied. These white-walled waves also call for investigation.

BUCHAN'S CHALLENGER REPORT ON OCEANIC CIRCULATION.

THE latest volume of the Challenger reports contains thirty-eight pages of text and sixteen maps, prepared by Dr. Alexander

Buchan, of Edinburgh, to illustrate the density and temperature of ocean water at different depths; all available material being employed in this elaborate discussion, whose ultimate object is the determination of the oceanic circulation. The charts exhibit the mean annual specific gravity of the surface and the bottom waters, the mean annual surface temperatures, and the temperatures at every hundred fathoms of depth to 1000, then at 1500, 2000 and at the bottom. At 400 and 500 fathoms the South Atlantic and the North Pacific are the colder oceans; the North Atlantic and the Indian are exceptionally warm. At 600 and 700 fathoms the most remarkable feature is the relation of North Atlantic temperature to the warm over-saline water that issues from the Mediterranean; a similar but less marked effect being noticeable in the Indian ocean near the Red Sea. The average at 700 fathoms being 38.°1, the northwestern Indian ocean is 44°, the eastern North Atlantic is 51°, with the maximum centering precisely towards Gibraltar. At 900 and 1000 fathoms the temperatures in low latitudes are symmetrically warmer than in high latitudes; but the difference is less than two degrees.

Dr. Buchan's text summarizes the facts and deals little with theories; but he accepts the winds as the chief cause of the surface currents, and he ascribes deep movements to differences of density, thus indicating the truth of both sides of the Croll-Carpenter controversy of a quarter century ago.

THE EASTERN MEDITERRANEAN.

The third series of the 'Berichte der Commission für Erforschung des östlichen Mittelmeeres,' recently issued in the memoirs of the Imperial Academy of Sciences of Vienna, contains further physical investigations by Luksch and Wolf on the basis of soundings on the 'Pola' in the Ægæan sea in 1893. The sea consists of a number of separate basins, of which the deepest (2250 met.) lies north of the east end of Candia. Much greater depths occur in the Mediterranean east and west of this island. Charts of temperature and salinity at the surface and at successive depths to the bottom exhibit the distribution of these features with much detail. The surface temperatures are maintained to a depth of about thirty meters; then follows a rapid cooling for seventy or a hundred meters, below which there is a gradual cooling to the bottom, where temperatures a little lower than 13° C. prevail.

AMERICAN GEOGRAPHICAL JOURNALS.

It is regrettable, but for the present perhaps not surprising, that no American geographical society issues a journal from which a student, teacher or general reader can gather a thorough acquaintance with geographical activity over the world. A journal of thorough and scientific character needs a background of accumulated experience, a large library and exchange list, a good number of active contributors and correspondents, and a large subscription list; and we have not yet been fortunate enough to develop all these conditions under a single control. The best association for such a journal in this country would be with the American Geographical Society of New York, its membership being large, its funds comparatively munificent and its library of long-continued growth and certainly much superior to that of any other similar society in the United States; but, although this society counts explorers, travellers, government officials, professors and a large representation of the general public among its members, the number of its producing geographers is small, and its quarterly Bulletin, now in its twenty-sixth volume, can hardly at present be included among the important geographical periodicals of the world. We understand that

plans for greater activity and enlarged form of publication are in consideration. The National Geographic Society of Washington is but a few years old. Its activity at present is greatest in its home city in the matter of geographical lectures, which are very successful. A list of this winter's lectures was given in SCIENCE No. 11. Its Magazine is of irregular publication, presumably on account of lack of funds. While it contains a larger proportion of physiographic matter than any other publication in this country, it gives practically nothing of general news or literature. Appalachia, the organ of the Appalachian Mountain Club of Boston, the Bulletin of the Geographical Club of Philadelphia, the Bulletin of the Geographical Society of the Pacific, and the papers of the Sierra Club, both of San Francisco, complete the list of geographical publications in this country as far as known to the writer. Geographical notes are given in the American Naturalist and in the Popular Science Monthly. All these geographical journals deserve warm support, especially in their own communities, but none of them presents the subject of geography nearly as fully as it is presented by several journals abroad.

FOREIGN GEOGRAPHICAL JOURNALS.

THE small amount of space that can be allowed in SCIENCE to geography makes it impossible to report on the progress of exploration, save when results of especial importance or of immediate physiographic interest are announced. Exploration is, however, fully presented in various foreign geographical journals; and, in the hope of extending their circulation in the libraries of our country, occasional notes of their character and contents will be here introduced. Preëminent among all such publications stand the Geographical Journal of the Royal Geographical Society of London, and Petermann's Geographische Mittheilungen, issued by the great geographical publishing house of Justus Perthes of Gotha and now conducted by Professor Alex. Supan. The Geographical Journal has for the great body of our students of geography the advantage of being in our own language, and it will therefore long continue to reach the larger circle of readers. Besides general articles and current news, ten or twelve pages are given in each number to notes on geographical literature by Dr. H. R. Mill, the entries being conveniently summarized by brief headings in bold type, arranged under countries. Extended reviews are made of important works. But those who can consult German sources—and this ability is now generally demanded of students in higher collegiate and university work—will find in Petermann's Mittheilungen an unrivaled bibliography of the whole range of geographical literature, from the geology of the earth beneath to the meteorology of the air above. Reviews of the more important publications are given in so extended a form that reference to original sources is unnecessary, except for the specialist in some particular division of the subject. Anyone who follows these reviews and the items of monthly news will acquaint himself very fully with the general progress of current geographical work. Other foreign journals will be referred to in subsequent numbers of SCIENCE.

WAGNER'S GEOGRAPHISCHES JAHRBUCH.

THIS indispensable annual, founded in 1866 by Behm and now in its seventeenth volume, is a fitting supplement to the other geographical publications of the house of Perthes in Gotha. The most important reviews and summaries in the Jahrbuch for 1894 are: on terrestrial magnetism by Schering, map projections by Hammer, ethnology by Gerland, geographical meteorology by Brückner, and on the geographical literature of the European countries by va-

rious contributors. Several of the latter are of great thoroughness and may serve as guides in ordering the best recent publications for public and college libraries. The most thorough are by Fischer on Southern Europe, Neumann on Germany and Sieger on Austria-Hungary. That by Schlichter on Great Britain and Ireland unwarrantably omits mention of the recent editions of Geikie's Scotland and Ramsay's England. The volume closes with a series of small scale index-maps, giving the state of advance of topographical surveys in Europe, India and the United States up to the autumn of 1894. One may thus determine at a glance whether the sheet for a certain locality in any country is yet published or not. The practical use of these indexes would have been increased if the name and address of the official bookseller from whom the maps may be purchased had been given.

FORSCHUNGEN ZUR DEUTCHEN LANDES- UND VOLKSKUNDE.

THE eighth and latest volume of these valuable essays, edited by Kirchhoff of Halle, and published at Stuttgart by Engelhorn, contains studies by Schreiber on the climate of Saxony, Partsch on the glaciation of the Riesengebirge, and Follman on the Eiffel, besides three others on historical and ethnological subjects. Schreiber's essay gives a full account of the periodic values of various climatic factors, but it is deficient in omitting all account of the unperiodic or cyclonic changes, which in winter are dominant, and fully deserve recognition as climatic elements. Partsch presents a careful study of the moraines and associated terraces of the Riesengebirge, which rise a few miles south of the extreme limit ascribed to the northern ice sheet in that region. The height of the snow line during glacial times is placed at about 1200 meters, by means of ratios between length of glaciers and area of snow fields, as determined in the Alps. An older and a younger glaciation are separated by a considerable interval, during which normal valley making was in progress. The author dissents from Berendt's views concerning a more general glaciation of the Riesengebirge. Follman's account of the Eifel is chiefly geological and descriptive, little attention being given to the development of the existing topography or to the explanation of the present courses of the streams. The volcanoes and the *maare*, of course, receive special attention.

PENCK'S MORPHOLOGIE DER ERDOBERFLÄCHE.

THIS is the most important work on physiography that has appeared during the past year; indeed, in many respects it is a unique work, one that will stand long at the head of works of its class. It is a worthy successor of earlier volumes in the series of geographical handbooks (published by Engelhorn, Stuttgart) to which it belongs—Ratzel's Anthropogeographie, Hann's Klimatologie, Heim's Gletscherkunde, Boguslawski and Krümmel's Oceanographie and others; and in the matter of citations of authorities it is much superior to any of its predecessors. Penck's acquaintance with the literature of his subject is truly remarkable. Each topic is outlined historically, as well as in its present status. A subject relatively so subordinate as the effect of the earth's rotation on rivers has thirty-five citations; sand dunes have fifty-one. Processes of deformation, deposition and denudation are all considered elaborately, with special reference to the forms that they produce, and this part of the book might properly be called *Morphogenie*. The forms themselves are considered afterwards at length. The more general headings in the table of contents are: Form and size of the earth; area of land and water, mean altitude of lands and depth of seas, volume of lands and

seas; continents and oceans and their permanence. Land surfaces; weathering and denudation by wind, rivers and ice; deformations of the surface. The forms of the land; plains, hills of accumulation, valleys, basins, mountains, depressions, caverns. The sea; its movements, coasts and bottom; islands.

The chief deficiency of the book is the scarcity of illustrations and the rough quality of nearly all the few cuts that are introduced. Many are merely diagrams, often with excessive vertical exaggeration. This is to be regretted in a subject where graphic aid of the highest quality is necessary for the adequate presentation of the facts. But as the work is in two volumes of 471 and 696 pages, the omission of illustrations has evidently been a matter of necessity.

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NOTES UPON AGRICULTURE (II.).

MUSCARDINE DISEASE OF CHINCH-BUGS.

ONE of the most serious of insect depredations to wheat and corn is that caused by the chinch-bug, and for years methods of checking it by employing a parasitic fungus have been the subject of research. In Kansas special appropriations have been made by the Legislature to determine the best means of propagating and applying the virus. The latest information upon this subject comes in the shape of a sixty-page bulletin with eight plates (No. 38, March, '95) from the Illinois Experiment Station prepared by Dr. Forbes. The fungus experimented with is *Sporotrichum globuliferum*, Speg., which was cultivated successfully upon a mixture of corn meal and beef broth and afterwards distributed to farmers in the chinch-bug infested portions of the State.

The White Muscardine (Sporotrichium) spreads most rapidly in the field when the weather is moist and the 'catch' is quickest in the low spots in the field and among fallen herbage. Professor Forbes is of the opinion that the disease may be developed without infection by artificially producing the above conditions by trampling down the grain in spots or cutting and stocking small portions as starting points for the infection. It was observed that mites feed upon the Muscardine and in some of the artificial cultures eat up 'the last vestige of the fungus.' The Sporotrichium lives upon many kinds of insects, and a plate is given of the appearance of it upon a leaf skeletonizer (Carnarsia), June Beetle (Lachnosterna), Walnut caterpillar (Datana).

BACTERIOSIS OF RUTABAGA.

THE number of diseases of plants of bacterial origin is rapidly on the increase, or, more strictly writing, the nature of these troubles is in these later days being better understood. A portion of Bulletin 27 of the Iowa Experiment Station is devoted to a disease of rutabagas that Professor Pammel finds, through a long course of bacteriological study, to be caused by a microörganism which he names *Bacillus campestris* n. sp., and figures in details in a plate. This disease is distinguished by its strong odor, the decay usually beginning at the crown of the root, the fibro-vascular zone becomes black, while the softer portions of the root become soft and finally watery. Healthy roots were caused to decay by introducing the Bacilli, previously isolated by cultural methods, into their tissue.

WEED SEEDS IN WINTER WINDS.

IT is well known that winds play an important rôle in the distribution of seeds. Professor Bolley, in the North Dakota Experiment Station Bulletin (No. 17, March, 1895), records that in two square feet of a three-weeks old and three-inch deep snow drift upon an ice pond ten yards from any weeds he found nineteen weed seeds, and and in another drift quite similarly situated thirty-two seeds representing nine kinds

of weeds. While the wind was blowing twenty miles per hour a peck of mixed seeds was poured upon the snow crust, and ten minutes after 191 wheat grains, 53 flax seeds, 43 buckwheat and 91 rag weed seeds were found in a trench thirty rods from where they had been poured upon the crust.

BLACK KNOT OF PLUMS AND CHERRIES.

The Black Knot fungus (*Plowrightia morbosa* Schw.) is an old orchard enemy. Professor Lodeman, in Bulletin 81 (December, '94) Cornell Experiment Station, has given the long bibliography of the subject and shows, by means of cuts, how the spores of the fungus may find their way between the adjoining layers of bark in the forks of the small limbs. At these places the bark is thin and the growing layer (cambium) comes near to the surface, thus facilitating the inoculation. Lodgement is also produced at these angles between stems, and besides it is here that knots are most apt to form. Experiments in spraying knotty trees with Bordeaux mixture gave results that were decidedly encouraging.

RECENT APPLE FAILURES.

In another bulletin (No. 84) from the Cornell Experiment Station—and there are many and fine ones—'The Recent Apple Failures of Western New York' are considered by Professor Bailey. A glance at the cuts shows that failures may be due to imperfect pollination, injudicious application of fungicides, but more particularly to the ravages of the Apple Scab (*Fusicladium dendriticum* Fl.), of which Professor Bailey gives a full page colored plate showing the scab enemy in detail from the appearance of the young distorted fruit to the microscopic structure of the fungus shown in leaf sections. That the scab fungus is the leading cause of apple failures is demonstrated by the fact that thorough spraying to check it productiveness has been obtained. The essentials for success in apple culture, as given by the author as his concise summary, are: "till, feed, prune, spray."

DETASSELING CORN.

The removal of the male flowers from a large or small per cent. of the corn plants in a field has been experimented upon at various stations. Thus in Maryland where two-thirds of the tassels were removed the detasseled rows gave a decrease of nearly 10 per cent. At the Kansas Station by detasseling alternate rows of six varieties in every case there was a reduced yield averaging 22 per cent. Delaware obtained under similar circumstances an increase of 6.6 per cent.

Before us is the bulletin (No. 37 Feb., 1895) upon 'Corn Experiments' of the Illinois Experiment Station in which detasseling receives its share of consideration. "In eighteen out of twenty-three comparisons the yield of corn was greater for the rows (alternate) having the tassels removed. For tassels pulled we have an increase of twenty-seven per cent., and for those cut only six per cent. Removed before expanding gives an increase of eleven per cent. The average increase is thirteen per cent." At the Cornell Station one report (1890) gave an increase of fifty per cent. for detasseling, but the next year there was no difference. The results thus far obtained teach that the end of experimentation in this direction is not yet reached.

Byron D. Halsted.

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LAGOA SANTA.

Such is the title of a memoir published in 1892 by Professor Eugene Warming, of the University of Copenhagen. It is also styled *Et Bidrag til den biologiske Plantegeografi*, and this sub-title sufficiently explains the aim of the work. Lagoa Santa is a small village about 835 meters above the sea and 200 miles north of Rio de Janeiro,

in the Brazilian campos, or hilly region beyond the great virgin forests of the coast mountains. Warming spent three years at this place, 1863–66, and made large collections of plants, which have been studied and described by various specialists. Now, after nearly thirty years, the author gives his general conclusions as to the flora of this region, which he considers typical of a great part of the interior of Brazil. The mean temperature is 20.5°C, with a range of 3.5° to 37°C. There are two seasons—*dry*, from April to September, corresponding to our winter, and *wet*, during the rest of the year. Spring opens in August. June is the coldest month, and December and January are the warmest months, but there is no winter in our meaning of the term, the means of the coldest month being only a few degrees below that of the warmest. The annual rainfall is not known, but it is considerable during part of the year, and there are heavy dews in the dry season. The heaviest rainfalls are in November, December and January. The soil is a red clay, very common in Brazil, resulting from the decomposition of the primary rocks. In places cavernous limestones occur.

There are no plains here, but only an interminable succession of hills with narrow valleys through which streams have cut gorges or in which there are lakes or ponds. Forests line the water courses and cover the calcareous rocks. These are a meager continuation of the luxuriant coast forests. The greater part of the country is, however, destitute of trees or bears only scrubby growths. These surfaces are the campos. They consist either of barren, pebbly plateaus and flanks of hills which are subject to washing, covered with scant herbage and often entirely destitute of trees, or of similar areas bearing deeper and more fertile clays and covered more or less densely with herbs, shrubs and small trees. The marsh and water plants form only an insignificant part of the vegetation, and may be left out of account in this synopsis. The contrast between the forest vegetation and that of the campos is very sharp, the plants of the latter resembling desert vegetation in many interesting particulars. Except in very rich parts of the campos the herbaceous vegetation is never dense enough to hide the hard red earth. Grasses are the most important part of the herbaceous covering. There are about sixty species, mostly Panicums, Paspalums and Andropogons. All are perennial and grow in thin scattered tufts, never forming a sod. The Cyperaceæ also grow in the same way. The composites are rich in species, especially the Vernonieæ and Eupatorieæ. The Leguminosæ come next in number of species. There are 554 species of herbs on the campos, but there are no biennials, and the number of annuals is very few, *i. e.*, less than 6%. There are also very few climbers or twiners although the campos bears many forms intermediate between erect herbs and climbing and twining plants. The great dearth of annuals is attributed to the great dryness and hardness of the soil at the time the seeds are shed, to the annual fires which consume seeds and seedings and may perhaps have transformed some annuals into perennials, and to the hard struggle for existence with tall herbs and bushes. Herbaceous shoots develop ordinarily in tufts and are not branched or but slightly, arising in great numbers from subterranean stems or roots. Exclusive of certain grasses, sedges and Bromeliaceæ, herbs with rosettes of basal leaves are almost entirely wanting. Horizontal rhizomes and stolons are absent and horizontal cauline organs always remain very short. Almost all of the perennial Dicotyledons have a short, thick, lignified, irregular, and more or less tuberous subterranean axis. Sometimes a delicate little shoot only ten to fifteen centimeters high arises from a tuberous axis as large as one's

fist. Juicy tubers and tender bulbs are very rare on the campos. Typical shrubs are not rare and in some places they form thickets. In other instances unbranched shoots arise in great numbers from a big, lignified, root-shaped axis and form tufts which are often very large. Generally, these tufts are only 0.35 to one meter high, but they cover a diameter of one to three meters and often more. This manner of growth resembles that of the herbaceous perennials, but the shoots are woody. The campos bears 170 to 180 shrubs. The families represented by most species are: Myrtaceæ 40–50, Malpighiaceæ 30, Melastomaceæ 20, Compositæ 15, Euphorbiaceæ and Lythraceæ 6–10, the rest of the species being scattered among twenty-five families. The tallest trees of the campos are three to eight meters high, and the densest growth forms a kind of forest, but this is never close enough to shade the earth. Sometimes the trunks rise obliquely, and both trunk and branches are twisted and stunted with thick, rough, channeled and cross-fissured bark. Many of them are also blackened and charred by the campos fires. There are eighty-six arborescent species on the campos, but many are only one to three meters high, and all resemble stunted fruit trees rather than ordinary arborescent vegetation. Phænogamic epiphytes and epiphytic mosses and lichens are very rare. Lianas are wanting, but some species show a tendency toward such types and these belong to genera which in the forest are developed largely or exclusively as lianas, *e. g.*, there are eighteen species of Serjania in the dense forest, all lianas, while on the campos the one species, S. erecta, is a shrub with lithe slender branches. Cactaceæ and all fleshy plants, exclusive of members of the orchidaceous genus Cyrtipodium, are also wanting and spiny plants are very rare. Certain families very common on the high mountains of Brazil, *e. g.*, Vellosaceæ and Ericaceæ, have no representatives on the campos. Finally the soil bears no mosses, lichens, algæ or fungi. This region is dry. The coast mountains and their virgin forests retain the moisture of the air, and the dryness is increased by the altitude. "The vegetation of the campos, properly speaking, is xerophilos. It is strange to see two forest growths developed side by side and often touching but differentiated in the sharpest possible manner, namely, the wooded campos and the forests. The latter accompany the water and streams everywhere. The trees are close together, tall and slender; lianas twine about them and epiphytes live upon them, and a coolness that is sometimes exquisite reigns in them. Proceeding from the streams the forests have invaded a certain territory on both sides to which, in course of time, they have brought a fertile humus. All at once, the forest stops and we find ourselves on the edge of the campos, where there is neither moisture nor shade, nor humus, and where the red clay earth cracks open in the dry season under the influence of the heat and desiccation. It is the soil conditions which have caused this antithesis. The difference in the quantity of water contained in the soil in the bottom of the valleys and on the summit and flanks of the hills of the campos has brought about these strong and curious contrasts between the two floras. It is certain that the geological formation exhibits no difference. In the campos and under the humus of the forests it is everywhere the same red clay."

The xerophilous character of the campos vegetation is manifest first of all in the shapes of the trees. On account of the dryness of the air these are small, stunted and twisted the same as in the high mountains of Brazil or in the maritime forests of "Restinga," along the sandy shores. Fires have also played a great rôle in developing stunted forms. The strong development

of the cortical system and the heavy suberization are due to the dryness of the air and probably also to the fires. The thick, irregular, ligneous, subterranean axial organs (it is often difficult to tell which part is stem and which is root) are also, both in herbs and shrubs, related to the aridity and to the fires. The absence of mosses and of hymenomycetous and other sayrophytic fungi is another indication of the dryness. The leaves show the dryness of the climate in numerous ways. An abundant hairy covering is very frequent, and the leaves of some species have both surfaces covered with a white or greyish felt, while others have only the lower surface felted. The leaves of other species are scabrous, hispid, glandular-hairy, or shining as if lacquered. A few have a waxy covering. Almost always, even in the herbs, the leaves are stiff and coriaceous, unless both surfaces are tomentose, and on some trees they are so stiff as almost to jingle in the breeze. Most of the grasses and sedges have narrow stiff leaves. The direction of the leaves also shows the aridity. Many are vertical or pointed upward, so as to receive the sun's rays at an acute angle. Some species are aphyllous and in others the leaves are much reduced. Usually, the leaves of the forest species are larger and especially broader than those of the campos species, even when of the same family or genus. "The most of the peculiarities which distinguish xerophytes are also found in the plants of the campos, although rarely to such a pronounced degree. The environment does not reach the excessive dryness of the deserts of Africa and Asia, of the high plateaux of Mexico, etc., and this explains the absence of cataceæ and other fleshy plants and the rarity or absence of succulent organs, such as tubers and bulbs. The dryness is never so great that vegetation is forced to disappear or dry up entirely for a longer or shorter period, as happens in the steppe or the desert, and the spring awakening is not so sudden as in these places. The dryness of the campos is also manifest in the fall of the leaves." Every year, when the sun has parched the herbage so that it is almost like hay, the campos are fired so as to get new growths for the cattle. These firings occur most frequently from July to September, but also earlier and later. The fires sweep everything that is close to the ground, including the lower branches of the trees, and cause the leaves to fall by thousands. When they are set too early, *i. e.*, in May or June, the succeeding vegetation is feeble, and when they are set too late in the spring, *i. e.*, after the spring vegetation has begun, they cause immense and lasting injury. When set at the proper time the campos are covered in a week or two with a rich carpet of green. Plants blossom earlier on the burned campos, and many species are seldom found in bloom elsewhere. The rarity of annuals has already been mentioned. The unbranched tufted habit of many shoots and the numerous swollen tuberous axial organs also seem to be due to the fires, and the numerous big underground stubs of trees and shrubs are undoubtedly due solely to this cause.

The forests of Lagoa Santa are not as imposing, as dense or as moist as those of the coast mountains. Those on the calcareous rocks in particular are quite open, dry and light. Tropical forests sometimes pass for being poor in flowers, but this is only an appearance, the blossoms being concealed in the tops of the trees. Most of the trees have small flowers. Like tropical forests in general the ground between the trunks is densely covered, in places impenetrably tangled, with bushes, small trees and lianas. The author observed nearly 400 arborescent species in the forest and thinks the actual number much exceeds this. These trees

belong to sixty-seven families, the leading ones including nearly one-half of the species, being Papillionaceæ, Myrtaceæ, Rubiaceæ, Lauraceæ, Artocarpaceæ, Cesalpinaceæ, Euphorbiaceæ, Meliaceæ, Mimosaceæ and Anonaceæ. The individuals of a species are widely scattered and it is often difficult to find more than one or two of a kind. The great number of species is attributed to the uninterrupted development of the forest during many geological ages, the campo-growths being a derived and more recent flora. The height of the trees is rarely more than 20 to 25 meters. The trunks are not scraggy like those of the campos, and the bark is smoother and less corky. The well lighted forests have a dense undergrowth of shrubs 1–3 meters high, most of which bear small white flowers. The soil of the forests is poor in herbaceous and suffrutescent species. There is no carpet of mosses or lichens. Agarics are small and very rare. Grasses form no part of the covering of the soil, and if any exist in the forest they are tall perennials such as Olyra and Bambusa. The forest is rich in climbing and twining plants, in striking contrast to the campos. The big woody lianas belong principally to Bignoniaceæ, Convolvulaceæ, etc., and the herbaceous climbers to Cucurbitaceæ, Passifloraceæ, etc. The Convolvulaceæ of the forests are generally voluble, while those of the campos are erect under-shrubs. The numerous Aristolochias of the forest are also all voluble, while the single species of the campos is an under-shrub with stems 15–30 centimeters high from a woody, tuberous, subterranean axis. The air is so dry that even in the forests there are but few Epiphytes. Cactaceæ and other fleshy plants, and numerous hairy, thorny and stinging plants grow in the more open forests on the calcareous rocks.

Only the forest lands are used for agricultural purposes. The trees are felled, and after the clearing has been subject to the heat of the dry season for some months it is fired and then planted—sometimes to sugar cane and rice, but more generally to Indian corn, with castor bean, perennial cotton, beans, cucumbers, pumpkins, etc., between the hills. After the second year the clearing is abandoned. These neglected clearings are soon covered with a dense growth of weeds, which are quickly crowded out by various shrubs—felted leaved and spiny Solanums, hispid Lantanas, dirty green or brown hairy Crotons, numerous Sidas and other Malvaceæ, dull composites often sticky, tall grasses with large leaves and many other plants, mingled with which are shoots from the tree stumps. Gradually the area becomes once more a forest, twenty or thirty years sufficing. It is said that after the forest has been cleared away three or four times it will not return, its place being taken by bushes, thickets of Pteris aquilina var. esculenta and dense masses of the glandular hairy Panicum Melinis; 43% of the weeds of the gardens and clearings are annuals, and a few of these weeds are old acquaintances, *e. g.*, Chenopodium ambrosioides, Gnaphalium purpureum, Xanthium Strumarium, Erechthites hieracifolia, Sonchus oleraceus, Panicum sanguinale, Eleusine Indica, Argemone Mexicana, Phytolacca decandra, Portulacca oleracea, Physalis pubescens, Datura Stramonium and Solanum nigrum.

The flora of the forest is twice as rich in species as that of the campos. Of the 755 genera observed at Lagoa Santa 82 belong exclusively to the campos, 61 are tributary to the water and 364 belong to the forests, although the latter only occupy a small part of the country. The forest flora is probably much more ancient than that of the campos. Compositæ and Papilionaceæ form about one-quarter of the entire flora of the campos. The flora of the forest is made up chiefly of Compositæ, Polypodiaceæ, Orchidaceæ, Rubiaceæ and Euphorbiaceæ. A large num-

ber of genera are common to both campo and forest, but often the species are not nearly related. In other cases the species resemble each other so closely that some botanists regard one as a variety of the others. The Brazilians have also noticed this in case of certain trees and designate one form as *do campo* and the other as *do mato*. Woody species are more common in the forest than on the campos, *i. e.*, 800 to 250. The number of herbaceous species on the campo and in the forest is about the same. Hygrometric conditions determine essentially the anatomy and the morphology of plants. This causes the difference in form and in thickness of bark of the trees of the campos and of the forest. In the campo plants there is a marked reduction of foliar surface to prevent excessive transpiration, and pilosity is most frequent in these species, although common in the forest, where it occurs most abundantly on the foliage of the trees and lianas, the glabrous plants of the forest being the lower and shaded species. A great many of the weeds are abundantly hairy. These grow principally in the clearings in narrow valleys exposed to a burning sun. Plants with lacquered leaves occur both on the campos and in the forest. Spiny plants are rare on the campos, more frequent in the forest, especially on the calcareous rocks, and most common in the clearings. Waxy leaved plants occur in various situations, but are not frequent. Coriaceous leaves occur on the woody plants of the campos and also frequently on the forest trees. They are not so common on the forest shrubs and are still rarer on the marsh plants. Many plants of the forest have large thin leaves, entirely unsuited for the campos. The fall of leaves is brought about by the increasing dryness of the air and soil rather than by any change of temperature. This is much more decided in the trees of the campos than in those of the forest and is most noticeable in the woody plants on the calcareous rocks. Some trees shed their leaves in winter and remain bare for several months, but most of the leaves fall in the spring (August to October) simultaneously with the appearing of new leaves, so that the forest is always green and retains about the same coolness and depth of shade. The trees of the campos as well as of the forest show annual rings, and the author thinks that the same periodicity of growth takes place everywhere, even in the trees on the Amazon. Buds are not generally protected by budscales, although some of the woody plants of Lagoa Santa bear as characteristic buds and budscales as any forest trees in Denmark. The author's principal collections were made from the small area of 170 sq. kilometers, from which he obtained about 2,600 species of vascular plants.

ERWIN F. SMITH.
WASHINGTON.

THE PROGRESS OF PARONYMY.

TEN years ago* I urged the desirability of the general employment of technical anatomic terms consisting, so far as practicable, of one word each (mononyms), and derived directly or indirectly from the Latin, constituting *paronyms* of the originals. Such paronyms might be either identical with the original, *e. g.*, English *pons*, or changed in various ways in conformity with the custom of each language, *e. g.*, French *pont*, Italian *ponte*. The subject was further discussed in connection with Prof. S. H. Gage in 1886† and in 1889,‡ and the principle of

* Paronymy *versus* heteronymy as neuronymic principles. Presidential address at the 11th annual meeting of the American Neurological Association, 1885. *Transactions of the Association*, pp. 21. Also *Journal of Nervous and Mental Disease*, Vol. XII.

† Anatomical technology: an introduction to human, veterinary and comparative anatomy. Second ed., 1886, O., pp. 600, 120 figs., 4 plates.

‡ Anatomical terminology. Reference Handbook of the medical sciences. A. H. Buck, editor, VIII., pp. 24. 1889.

paronymy was approved by the Committee on Biological Nomenclature in the Report adopted by the American Association for the Advancement of Science, August, 1892.

Naturally the application of the principle has been easier with the French and Italian than with the German. Yet nearly all recent works in this language contain paronyms either unchanged (excepting for capitalization), *e. g.*, *Dura*, or with slight changes, *e. g.*, *Hippokamp* for *hippocampus*.

The last example of Germanization to come under my notice is in Eisler's 'Das Gefäss- und periphere Nervensystem des Gorilla," where the customary heteronym, *Herzbeutel*, is abandoned for the regular paronym of *pericardium*, *Perikard*. Curiously enough in English we have hitherto retained the useless termination, but analogy with *pericarp* (from *pericarpium*) not only warrants but demands the abbreviated form, *pericard*.

BURT G. WILDER.

ITHACA, N. Y.

THE MARINE BIOLOGICAL LABORATORY.

THE annual announcement of the 'Marine Laboratory' for the eighth season, 1895, has recently appeared.

The officers are as follows: Dr. C. O. Whitman, Director, Head Professor of Zoölogy, University of Chicago, and editor of the *Journal of Morphology;* Dr. H. C. Bumpus, Assistant Director, Professor of Comparative Anatomy, Brown University.

ZOÖLOGY.

A. Investigation. Howard Ayers, Professor of Biology, University of the State of Missouri; E. G. Conklin, Professor of Biology, Northwestern University; S. Watase, Assistant Professor of Zoölogy, University of Chicago; M. M. Metcalf, Professor of Biology, The Woman's College of Baltimore; C. M. Child, Fellow in Zoölogy, University of Chicago; F. R. Lillie, Instructor in Zoology, University of Michigan; O. S. Strong, Instructor in Zoölogy, Columbia College; H. S. Brode, Fellow in Zoölogy, University of Chicago.

B. Instruction. W. M. Rankin, Instructor in Zoölogy, Princeton College; J. L. Kellogg, Professor of Biology, Olivet College; P. A. Fish, Instructor in Physiology and Anatomy, Cornell University; A. D. Mead, Fellow in Zoölogy, University of Chicago; H. E. Walter, Chicago.

BOTANY.

W. A. Setchell, Instructor in Botany, Yale University; W. J. V. Osterhout, Instructor in Botany, Brown University.

PHYSIOLOGY.

Jacques Loeb, Associate Professor of Physiology, University of Chicago; W. N. Norman, Professor of Biology, University of Texas.

The work of the laboratory is definitely organized with reference to the needs of three classes of workers, namely, (1) students, (2) teachers of science, and (3) investigators. There are regular courses of instruction, consisting of lectures and laboratory work under the supervision of the instructors, given in Zoölogy, Botany, Embryology and Physiology. In addition to these, there will be courses of lectures on special subjects as follows: Embryology, by the Director, Professor C. O. Whitman; on Botanical Museum Development, by J. M. McFarlane, and on Matter and Energy, by E. A. Dolbear.

There will also be evening lectures on biological subjects of general interest. Among those who contribute these lectures may be mentioned: G. F. Atkinson, E. G. Conklin, Northwestern University; J. M. Coulter, President Lake Forest University; A. E. Dolbear, Tuft's College; Simon Flexner, John Hopkins Hospital; E. O. Jordan, University of Chicago; William Libbey, Jr., Princeton College; F. S. Lee, Columbia College; W. A. Locy, Lake Forest University; J. M. MacFarlane, University of Pennsylvania; C. S. Minot, HarvardMedical School;

E. S. Morse, Peabody Academy of Science; H. F. Osborn, Columbia College; W. B. Scott, Princeton College; W. T. Sedgwick, Massachusetts Institute of Technology; William Trelease, Director Missouri Botanical Garden; S. Watase, University of Chicago; E. B. Wilson, Columbia College; B. G. Wilder, Cornell University; W. P. Wilson, University of Pennsylvania.

The laboratory has been considerably enlarged and now consists of four two-story buildings, with forty private rooms for the exclusive use of investigators, and seven general laboratories. It is supplied with aquaria, a steam launch, boats, dredges, and all the apparatus necessary for collecting and keeping alive material reserved for class work or research.

A Department of Laboratory Supply has been established in order to facilitate the work of teachers and others at a distance who desire to obtain material for study or for class instruction. Circulars giving information, prices, etc., may be obtained on application.

The forty private laboratories are distributed as follows: Zoölogy, twenty-two; Physiology, eight; Botany, ten. These rooms are rented at one hundred dollars to colleges, societies or individuals.

The general laboratories for research are for the use of students engaged in special work under the supervision of the Director and his assistants, and for advanced courses preparatory to beginning investigation, such as the course in Embryology. There are forty-two tables, of which Zoölogy has twenty-two, Physiology ten, and Botany ten.

Applications should be made to Professor C. O. Whitman, University of Chicago, Chicago, Ill.

EMBRYOLOGY.

THE course in Embryology extends from July 10th to August 17th. The aim is not only to master the details of development, but also to acquire a thorough knowledge of preparing surface-views, imbedding in paraffin and celloidin, staining, mounting, drawing, reconstructing modeling, etc. The study is mainly confined to the fish egg as the best type for elucidating vertebrate development; but the eggs of amphibia and other vertebrates as well as some invertebrates will receive attention. The fee is $50.

INVESTIGATION.

THE course in Investigation extends from July 3d to August 17th. For those prepared to begin original work, ten tables are reserved in Zoölogy, and the same number in Physiology and Botany.

Special subjects for investigation are assigned to the occupants of tables, and the supervision of the work is so divided that each instructor has the care of but three or four students. In this way all the advantages of individual instruction are secured. The fee is $50.

SEMINAR.

A SEMINAR has been instituted, and, though specially designed for members of the class in Embryology and beginners in investigation, it is open to all. The third volume of the Biological Lectures will be made the basis of discussion. Most of the authors of these lectures will be present; and from two to three mornings will be devoted to the consideration of each lecture and such questions as may be raised.

LABORATORY FOR TEACHERS AND STUDENTS IN ANATOMY.

IN the Laboratory for Teachers and Students in Anatomy, which is open from July 2d to August 30th, two courses are offered: the first, in Invertebrate Anatomy, and the second, a newly arranged course in Vertebrate Anatomy. The fee for either course is $40.

VERTEBRATE ANATOMY.

THE list of lecturers on Vertebrate Anatomy will be as follows: Professor H. P.

Bowditch, Harvard Medical School; Dr. F. S. Lee, College of Physicians and Surgeons; Dr. C. F. Hodge, Clark University; Dr. O. S. Strong, Columbia College; Dr. C. S. Minot, Harvard Medical School; Dr. J. S. Kingsley, Tuft's College; Dr. J. P. McMurrich, University of Michigan; Dr. H. F. Osborn, Columbia College.

Applications for admission to the laboratory for students and teachers should be made to Prof. H. C. Bumpus, Brown University, Providence, R. I.

BOTANY.

The laboratory work in Botany (July 10–August 17) will be restricted to the study of the structure and development of types of the various orders of the cryptogamous plants, and especial attention will be given to the study of the various species of Marine Algae which occur so abundantly in the waters about Woods Holl.

The following colleges and societies controlled private rooms or tables during the season of 1894:

Boston University School of Medicine, Brown University, Bryn Mawr College, College of Medicine, Syracuse University, College of Physicians and Surgeons, Columbia College, Hamilton College, Harvard University (Professor Farlow), Lake Forest University (President Coulter), Massachusetts Institute of Technology, Miami University, Mt. Holyoke College, Missouri Botanical Garden, Northwestern University, Princeton College, Smith College, University of Chicago, University of Cincinnati, University of Pennsylvania (Provost Harrison), Vassar College, Wellesley college, Williams College, Women's College Baltimore, American Association for the Advancement of Science, American Society of Naturalists, Beta Alpha Chapter of the K. K. G. Fraternity of the University of Pennsylvania, Lucretia Crocker Scholarship, Woman's School Alliance Milwaukee.

THE GENERIC NAMES OF THE THREE-TOED ECHIDNA.

The three-toed *Echidna* discovered by M. Bruijn in northwestern New Guinea, and described by Peters and Doria in 1876 as *Tachyglossus bruijnii*, has been commonly recognized as belonging to a different genus from the common five-toed *Echidna* of Tasmania and Australia. Although the species was described less than twenty years ago, four generic names have been proposed for it. Early in 1877 Dr. Theodore Gill erected the genus *Zaglossus** for it, and Gervais separated it in November of the same year under the name *Acanthoglossus*;† but a few days later, finding that this name had been pre-occupied, he renamed the genus *Proechidna*.‡ Five years later M. Dubois proposed to replace *Acanthoglossus* by *Bruynia*.§

Of these four names *Proechidna* has come into general use, while *Zaglossus* Gill seems never to have been mentioned by any subsequent author. My attention was first called to it several months ago by Dr. Gill himself, who suggested that it would probably antedate *Proechidna*, but no copy of Gervais' Ostéographie being at hand I could not determine which name had priority. Recently I have had an opportunity of examining a copy of the Ostéographie des Monotrèmes, and find that not only does *Zaglossus* antedate *Proechidna*, but in fact it was the earliest name proposed for the genus, and should be adopted to the exclusion of all the others.

The second chapter of the Ostéographie, apparently the only part of the text ever published, contains the name *Proechidna* on page 43. In the introductory foot-note on

* Ann. Record of Science & Industry for 1876, May 5, 1877, p. clxxi.

† Comptes Rendus, lxxxv., No. 19, séance du 5 Nov., 1877, p. 838.

‡ Ostéographie des Monotrèmes Viv. et Fossiles, Nov. 30, 1877, p. 43.

§ Bull. Soc. Zool. de France, vi. No. 6 (1881) 1882, pp. 267–270, pls. ix–x.

page 41, dated '*30 Novembre, 1877*,' M. Gervais gives the reasons for publishing the second chapter first, and states that the first and third chapters will probably appear during the year 1878. From this statement it is evident that *Proechidna* could scarcely have been published prior to December 1, 1877. The Annual Record of Science and Industry for 1876, on the other hand, was received at the Library of Congress, Washington, D. C., on April 28, 1877. This date, however, may be the date of entry for *copyright*, and does not necessarily show that the book was issued on April 28. A copy of the same volume in the library of the U. S. Patent Office, Washington, D. C., was received early in May, while the publishers, Messrs. Harper & Brothers, give the exact date of publication as May 5, 1877.

The synonomy of the genus should stand:

Zaglossus Gill, May 5, 1877.

Acanthoglossus Gervais, Nov. 5, 1877 (Date of reading, *not* of publication).

Proechidna Gervais, Nov. 30, 1877 (Date of prefatory foot-note).

Bruynia Dubois, ———, 1882.

The evidence seems sufficient to show that *Zaglossus* was published at least as early as May 5, 1877, and, therefore, antedates *Acanthoglossus* by six months and *Proechidna* by nearly seven months.

T. S. PALMER.

WASHINGTON.

CORRESPONDENCE.

SPECTROSCOPIC OBSERVATIONS OF SATURN AT THE ALLEGHENY OBSERVATORY.

TO THE EDITOR OF SCIENCE: As certain observations of mine on the spectrum of Saturn have been widely noticed by the daily press, and various reports have been spread, some of which are correct and some incorrect, but none of which were made by my authority, I take this opportunity to explain the real character of the observations. It is hardly necessary for me to say here that I have made no 'claims' whatever respecting them.

The observations furnish a direct proof of the accepted hypothesis that the ring of Saturn consists of a multitude of small bodies revolving around Saturn in circular orbits. The hypothesis is an old one, but its universal acceptance dates from the publication of Maxwell's prize essay in 1859. While the mathematical proofs given by Maxwell and his predecessors are conclusive, a demonstration of the hypothesis by the widely different method of direct observation with the spectroscope is not, I think, without interest.

The proof depends upon an application of the well-known principle of Doppler, by which the motion of a heavenly body in the line of sight can be determined by measuring the displacement of a line in its spectrum. Under the two different hypotheses, that the ring is a rigid body, and that it is a swarm of satellites, the relative motion of its parts would be essentially different; hence, to distinguish between these two hypotheses it is only necessary to find a method of sufficient delicacy, in order to bring the question within the province of the spectroscope. Any method depending on the successive comparison of the spectra given by different parts of the ring would be almost certain to fail. The method which I have employed is explained below.

If two planes, at right angles to each other, are passed through the observer and the system of Saturn, one (A) passing anywhere through the system and the other (B) through its center, the velocity, resolved in the direction of the line of sight, of any point on the surface of the system where it is intersected by plane A can be expressed as a function of the perpendicular distance of the point from plane B. It is only necessary to consider the case when the plane A is parallel to the major axis of the apparent ring. On the assumption that the

ball of Saturn rotates as a solid body, and the ring as an assemblage of particles, each of which moves with a velocity determined by Kepler's third law, the expressions for the ball and for the planet are very different, the former being linear, and the latter an equation of a degree higher than the second. I have determined these expressions for the special case above mentioned. They are still further simplified by assuming that plane A also passes through the center of the planet.

Now, if we bring the image of Saturn, formed by a telescope, upon the slit of a spectroscope, with the slit in the intersecting plane A, the expressions above referred to are also the equations to the curves of which the lines in the spectrum of the planet are a part, referred to an undisplaced spectral line and the perpendicular line through its center as axes; for, in these curves, x is proportional to the perpendicular distance from plane B, and, by Doppler's principle, y is proportional to the velocity in the line of sight. The simplest case is, of course, that in which the slit coincides with the major axis of the ring; this is also the condition for which the differential velocity of points on the surface of the ring is a maximum, and it is one which can be approximately realized in observation.

Hence the laws of rotation of the component parts of the system can be determined (within certain limits) by the *form* of the special lines, and the form can be determined with very considerable accuracy by photographing the spectrum with a suitable instrument.

According to the assumptions which have been made above, and which represent the accepted hypothesis, lines in the spectrum of the ball are straight, but inclined; as compared with their direction the general inclination of the (theoretically) curved lines in the spectra of the opposite sides of the ring is smaller, and it is *reversed*. The actual aspect of the lines on my photographs is in exact accordance with that required by the hypothesis.

If the ring rotated as a whole, the lines in its spectrum would be straight, and their direction would pass through the origin; they would be very nearly prolongations of the planetary lines. Such an aspect of the lines as this could be recognized on my photographs at a glance.

The direction of a line free from displacement was obtained by photographing the spectrum of the full moon on the same plate, on each side of the spectrum of Saturn.

For further details, with the numerical results of measurement of the plates, I must refer to the May number of the *Astrophysical Journal*, in which I have described these observations at some length.

James E. Keeler.

Allegheny Observatory.

A GENERAL SUBJECT-INDEX TO PERIODICAL SCIENTIFIC LITERATURE.

The Editor of Science—*My Dear Sir:* I notice that you are printing in Science various replies to the circular of the Royal Society of London relating to the matter of a general subject-index to all scientific publications. Your correspondents have so far been in favor of such an undertaking. As I do not believe it to be practicable, it may be of interest to some of your readers to see my own reply which I venture to send herewith. I have made a few trifling changes in the copy which I enclose.

I am, very respectfully,

Edward S. Holden.

The Lick Observatory,
March 30, 1895.

Mount Hamilton, April 24, 1894.

To Professor M. Foster, *Secretary R. S., Chairman of the Committee on a Subject-Index, etc., etc.*

My Dear Sir: I beg to acknowledge receipt of the circular of April 6 relating to a pro-

posed subject-index of scientific papers, and to express my opinions on some of the points contained therein. I will not burden you with the arguments that might be brought forward in support of the opinions, at this time; but, of course, I am very ready to give my reasons in detail should you desire them.

I. It appears to be of the utmost importance that the Royal Society should continue to issue its author-indexes, *i. e.*, the quarto Catalogues of Scientific Papers. Such indexes can be made at comparatively small expense, and by comparatively unskilled workers, under the direction of a single competent scientific head.

II. It is entirely otherwise with a subject-index. *Here the routine work must be done by the expert.* Professor Helmholtz was none too good to make the subject-index of his Optics. If it had been made by one of his pupils, it would have been less valuable; if it had been made by clerks, it would have been of little use except to beginners. It is perfectly clear that, in general, we cannot expect our bibliographies, etc., to be made by the heads of science, as Helmholtz, Houzeau, etc., and it therefore seems to me that it is unadvisable to attempt a general subject-index to science on any plan whatever.

III. If it is ever attempted at all, it should not, in my judgement, be done by international coöperation, but by a single society responsible only to itself. International coöperation has, I believe, generally failed (the only marked exceptions that I recall are the International Geodetic Association and the International Bureau of Weights and Measures). The Zone observations of the German Astronomical Society are of the highest use and excellence, but they were begun by international coöperation about 1866 and are not yet published.

IV. If the work is attempted, it should be printed in English alone, one would think. If the past is not ours, the future surely is to be.

V. My own opinion, therefore, is that the general subject-index should not be attempted. The Royal Society and other great academies might well subsidize the making of special bibliographies, for example, Houzeau's Bibliographie de l' Astronomie (already printed), or Professor Cleveland Abbe's Bibliography of the Literature of Meteorology (now in MS.), and other undertakings of the kind, when they are directed by men of special learning, and not otherwise.

VI. It, however, appears to me that the Royal Society can do a great work in the direction aimed at, at comparatively litttle expense and trouble, as follows: I would, first, say that it is necessary—essential—that an author-index should be complete. It is very desirable, but by no means essential, that a subject-index should be exhaustive. A subject-index is generally required to set the inquirer on his way, and once fairly started in his reading, the foot-notes will keep him informed. This being granted, the plan I refer to is for the Royal Society to undertake the publication, in one volume, of a subject-index, or guide, to the ten quartos of author-indexes already pre-prepared. The work could be easily done as follows: Select a scheme of subject-headings, under the advice of specialists. The Melville Dewey plan of library cataloguing* would serve as a basis, and it is capable of indefinite and logical subdivision. This subdivision should be made under the advice of the heads of English science; and, in my opinion, the thing to be avoided is too minute division. A practical point is, also, that the same paper should be catalogued under all the headings under which it might be sought, not merely under the strictly logical and appropriate heading.

* Which is based on the scheme of Dr. W. T. Harris, Editor of the Journal of Speculative Philosophy.

This is a detail, but it is of prime importance.

For each subject, as Astronomy, appoint a Director who should be the best man obtainable, but who may be any competent and faithful astronomer, even if he is without very wide experience and reading. Let each Director go over the author-indexes already in type, and mark each entry there printed with the numerals expressing its class or classes. Many, in fact most, of these papers can be pretty well classified from their titles alone, especially if the subject-index is not too minutely subdivided. All cases of doubt must be resolved by a reference to the original memoir. A clerk follows the Director. He finds under *Newcomb* certain papers which have been marked by the Director as relating to Astronomical Optics—Class XXXII., say. He, therefore, collects these on a card, thus:

XXXII.

Newcomb (*S*): Nos. 1, 11, 19, 26 (vol. I.).

In a subsequent volume he finds other entries belonging under class XXXII. and under *Newcomb*, and makes a separate card for them, noting the volume. The same thing is done by the Director for Astronomy for all his classes and for each author; and by the Directors of other subjects in like manner; and they are followed by copyists. Finally all cards are sorted into one series:

First, by the class—as XXXII.

Second, alphabetically by authors, and then revised and printed thus.

Class XXXII.—Astronomical Optics—Optics of the Telescope; see also classes XCV., etc., etc.

Abbe (*C*): Vol. i., 17, 34; ii., 80; ix., 92, etc.

Albrecht (*T*): Vol. vii., 13; viii., 31.

Auwers (*A*): ii., 7, 23; iii., 18, 37; iv., etc., etc., etc., etc.

By following out this plan under intelligent Directors for the special topics, the Royal Society would very soon have a nearly complete subject-index in one volume, covering its author-indexes, vols. i.–x.; and the plan, once in operation, could be carried on without trouble and at small expense. Such a subject-index would, in my view, supply all real needs in science. It certainly would in my branch of it.

The only objection that I can see to this plan is that it is not perfectly complete and logical to the extremest point. If the preface to the proposed book declares that it is not intended to be so, it seems to me that the Royal Society need not mind. After the book was printed it would, I think, be used by everyone; and it would, I believe, meet the wants of every one as nearly as any practicable plan could do.

If I have extended my remarks too far, I beg you to excuse me. I have desired to show what seems to me to be an easily obtained benefit to science, and I trust my suggestion is not impertinent to your inquiry. I am, My Dear Sir, with high regard, Very faithfully yours,

Edward S. Holden.

SCIENTIFIC LITERATURE.

Ein Geologischer Querschnitt durch die Ost-Alpen, nebst Anhang über die sog. Glarner Doppelfalte von A. Rothpletz, mit 2 Tafeln und 115 Abbildungen im Text. Stuttgart. 1894. Pp. 268.

This valuable contribution to our knowledge of mountain structure is arranged in three parts. The first of these is a statement of the petrography and stratigraphy, and the second an account of the tectonic, of a cross-section of the Alps, in the meridian of Munich, from the plain of the Po to the Bavarian plateau, a distance of about 230 km. The third part is a discussion of the general results of the author's study. The details of the first two parts are well illustrated, both by the fine geologically colored profile on a scale of $\frac{1}{75000}$, and by

the numerous excellent cuts throughout the text. Only the conclusions of the author can be adverted to in the present brief notice.

The eastern Alps have an east and west trend and the section is normal to the strike. The highest mountains have an elevation of about 3500 m., and lie towards the northern end of the section. The average elevation is 1800 m. In the northern Alps there are three principal folds, in the middle Alps four, and in the southern three, with many subordinate folds throughout. None of these folds remain in their original continuity. Fractures separate one from another and chop each of them up into a series of blocks. By faulting on these fractures the folded arrangement of the strata is greatly disturbed and obscured.

The special features of the faulting are:

1. The prevalent dislocation of synclines in such a manner that their axial troughs are thrust up and the wings dropped.

2. Anticlines with dropped crests so that the newer strata of the crests appear below the older strata of the wings. Not well exemplified in the section.

3. The occasional downthrow of the axial troughs of synclines with uplift of both wings.

4. The faulting of anticlines on longitudinal axial planes and the conversion of the convexity of the anticlines into concavity by subsequent compression.

5. Thrusts. There are five important overthrusts in the section ranging in inclination from 20° to 70°, the overthrust in all cases being toward the south.

6. Cross fractures. Highly inclined to the longitudinal faults and generally nearly vertical. These are not expressible on the profile, but are of the utmost importance for a proper appreciation of Alpine structure. They are subsequent to the folds and associated longitudinal faults, and are the latest manifestations of the orogenic forces. As such they have exerted a powerful influence upon the topography, giving the Alps, in the opinion of the author, their transverse drainage outlets and many of their lake basins.

7. There are also faults which antedate the period of Alpine folding.

In discussing the age of the folding of the Alps the author makes it clear that there have been at least two chief periods of folding, one pre-Permian, and the other post-Miocene. There were, however, diastrophic movements in the interval. This is proved, first, by the faults which antedate the later folding, and second, by the oscillation of the ocean border in the intervening time. In discussing the latter argument the author gives a series of nine profiles showing the hypothetical relative distribution of land and water over the Alpine region in *old Paleozoic*, *Permian*, *Muschelkalk*, *Rhætic*, *Lias*, *Neocomian*, *Eocene*, *Miocene* and the *Present*. These show a trangression of the sea up to the close of the Triassic, followed by a steady recession from then on to the present time. The sections, considered by themselves, might lend support to the hypothesis of Suess that the oscillation is due to the variation of the surface of the ocean. But other sections in neighboring parts of the Alps give discordant results, and it is concluded that the Alpine region was the scene of diastrophic movement between the Permian and Miocene, whether the ocean surface oscillated or remained constant.

The shortening of the arc of the earth's surface in the line of the author's section is 18 per cent., *i. e.*, the region has, in consequence of the folding, now only about four-fifths of its original breadth. If the folding of the central Alps be assumed to be pre-Alpine, then the shortening is reduced to from 12 to 13 per cent., or about one-eighth. The author contrasts these

figures with the much higher values obtained by Heim, who places the shortening of the arc in the north and central Swiss-Alps at one-half. He discredits the structural interpretations which have led Heim to so large a value. He takes issue with the latter, particularly in the interpretation of the so-called Glarner double fold, and discusses this structure at length in an appendix to the volume, interpreting the structure as an overthrust and not a double fold.

In discussing the mechanics of the lateral thrust, to which all are agreed the Alpine structure is due, the author says the earth's crust may be considered a virtual arch. Then the continents must be either arches of less radius than that of the earth as a whole, or they must be superficial masses reposing upon the arch. In the latter case the continental masses would suffer no folding, but would lie as a dead weight upon the laterally compressed and folding arch below. This being contrary to experience, it is rejected, and the alternative is adopted that the continents are arches of smaller radius. The condition of folding of strata by lateral compression is, then, that they must lie below the limiting curve of the continental arch. So long as they lie above this curve they escape folding. Where folding occurs under the dead weight of rocks lying above the curve it is manifest at the surface only as elevation or depression. But the load tends to restrain folding and the latter takes place most readily where the load is least. This occurs where the continental arch merges into the geoid arch. Here is the weakest part of the arch; here the strongest folding should arise. Orogenic folding is most effective on the borders of the oceans. This fact the author finds in accord with his theoretical deductions, for it is on the oceanic borders that the continental and geoid arches intersect.

This principle is resorted to in explanation of the common up-throw of synclinal troughs. The deep synclinal folds will suffer most from the lateral compression. The consequence is that the axial troughs of the synclines are faulted up and the anticlines relatively dropped.

Part of the transverse cleavage of the rocks is ascribable to pre-Permian orogenic forces and part to the later compression which gave rise to the Alps. Most of the pre-Permian strata show this cleavage in a pronounced degree. This cleavage is best developed in the Zillerthaler towards the middle of the section, and least so on the margins of the Alpine region. The author suggests, in explanation of this deficiency of cleavage on the margins, that these parts were folded under a less load than the more central portions and were earlier lifted above the line of compression. The limestones are characterized by suture-like cracks so well known in limestones and marbles the world over. These are held by the author to be due to solution under pressure, and evidence in favor of this view is adduced.

The discussion of the metamorphism is perhaps the least important section of the book, and contributes little of importance to the general subject.

The discussion of the *cause* of mountain uplift and folding is chiefly interesting for the clear and concise statement of the expansion theory as an adequate explanation of the origin of mountain structures and plateau uplifts. The advantages of this theory over the doctrine of the earth's contraction under secular cooling are clearly set forth. The doctrine of secular contraction fails to give an adequate explanation of the phenomena of volcanology; it does not account for the distribution of the force of gravity; and it involves too great a shortening of the earth's radius. The expansion theory does not have these objec-

tions. The admissibility of the expansion theory is based on the assumption that the earth magma *may* expand on solidifying as water does. The recent work of Barnes, however, with which our author was probably not familiar at the time he wrote, so invalidates this assumption that it is no longer worthy of serious consideration.

A. C. LAWSON.

UNIVERSITY OF CALIFORNIA.

Mesozoic Plants From Kōsuke, Kii, Awa and Tosa. By METAJIRO YOKOYOMA, Professor in the Imperial University of Japan.

In this paper, illustrated by nine plates of good figures, and published as part III., Vol. VII., of the *Journal of the College of Science*, Imperial University of Japan, Professor Yokoyoma has given us a valuable addition to our knowledge of the lower Cretaceous flora. The plants of this age, known for a long time mostly in their Wealden types, and from a few localities in England and on the continent of Europe, have, by recent discoveries, been greatly increased in number and variety. The extent of the territory known to have been occupied by them has of late been still more notably enlarged. We now know lower Cretaceous plants from such widely separated series of strata as the Potomac of the Atlantic States: the Comanche series of Texas, the coal group of Great Falls, Montana; the Kootanie series of British Columbia; the Shasta group of California; the lower strata of Newton's Dakota group in Dakota and Wyoming. Professor Yokoyoma's investigations add still another region on the Asiatic side of the Pacific, and make it probable that the lower Cretaceous flora was in Asia no less important than it was in North America. These additions are especially gratifying, as the flora of this time was the last one in which angiosperms did not predominate. It is the flora of an era when predominating Mesozoic elements were about to disappear forever. If we are ever to learn what changes caused a flora consisting only of Equiseta, Cycads, Ferns and Conifers to give way to one in which angiosperms overwhelmingly predominate, and in which all these groups, except the conifers, play an insignificant part, we shall most probably find the solution of this as yet unsolved problem from the examination of lower Cretaceous plants.

In 1890 Prof. Nathorst, of Stockholm, examined a number of fossil plants from Shikoku, Japan, and determined their age to be either upper Jurassic or Wealden. Professor Yokoyoma states that he was induced to carry the investigation of this flora farther than the Swedish paleontologist had done, with the hope of fixing more definitely its age. In consequence of this he collected not only from the localities of Nathorst, but from several others showing a similar flora. He succeeded in adding a number of species not seen by Nathorst, and in procuring, in some cases, better specimens of those previously obtained. In this way the total number of species was brought up to 26, with 2 varieties. It is noteworthy that, while the flora is without doubt lower Cretaceous in age, as Professor Yokoyoma determines it to be, it contains no angiosperms. He identifies several of the species with certain ones found in the lower Potomac strata of the eastern United States. He states his conclusion as to the age of the plants in the following words: "I go a step farther than Professor Nathorst and say that the plant-bearing beds of Kozuki, Kii and Shikoku represent the whole Neocomian series, corresponding to the Potomac of America." This statement, so far as the Potomac is concerned, would be more correct if it made the Japanese beds correspond to the *lower* Potomac. American geologists now include in the Potomac the Tuscaloosa group and the South Amboy series of beds, both of which contain few, if

any, of the characteristic plants found in the lower strata of the Potomac of Virginia, while angiosperms overwhelmingly predominate in each. Until the Japanese beds show angiosperms they cannot be considered as young as the uppermost portion of the lower Potomac, which, in the Brooke locality, Virginia, and at Baltimore, Maryland, show many angiosperms.

Prof. Yokoyoma has followed Prof. Nathorst in changing from Dioonites to Zamiophyllum, the name of a cycad that, so far, is confined to the lower Cretaceous. This is the species known as *Dioonites Buchianus*. This change does not seem to be called for. The reason assigned by Prof. Nathorst does not seem weighty enough to remove a name so well fixed as this, and, if a change be made, the name Zamiophyllum seems open to more objections than Dioonites. The leaflets of Zamia are articulated at their junction with the rachis and deciduous, characters which are decidedly not found in Dioonites Buchianus. These features seem to be of more importance than the obliquity of the leaflets and their narrowing towards the base, which characters in Dioonites Buchianus Professor Nathorst presents as objections to regarding this plant as a Dioonites.

Wm. M. Fontaine.
University of Virginia.

Repetitorium der Chemie. By Dr. Carl Arnold. Sixth Revised and Enlarged Edition. Hamburg and Leipzig, Leopold Voss. 1894. 8°. Pp. x+613. Paper. Price, 6 marks.

This book has been written for medical students and is intended to be used by them as a convenient reference book in connection with lectures upon inorganic and organic chemistry and in preparing for examinations. That there is a demand for such a book is shown by the fact that since it first appeared, in 1884, six editions have been called for.

The work is divided into three sections. In the first one of fifty pages the general principles of the science are considered. Such topics as the laws of stoichiometry, the atomic and molecular theory, the determination of molecular and atomic weights, theory of valence, constitutional formulas and the periodic classification of the elements are here discussed. The treatment of these subjects is necessarily very brief and is not intended to be exhaustive. As far as it goes, however, it is clear and concise, and, on the whole, the views of the author represent fairly well the present position of the science. To a few statements, such as those on pages 6 and 31 that heat, light, electricity and chemical affinity are known to be different forms of motion (*bekanntlich nur verschiedene Bewegungsformen darstellen*), one is inclined to take exception.

The second section of 216 pages deals with descriptive inorganic chemistry. The elements are arranged under two heads, first the non-metals, then the metals. The more important facts as to the occurrence, preparation and properties of each element and its chief compounds are here systematically and concisely presented. Newly discovered facts in this field of chemistry have not been overlooked. Thus, for example, we find here described the preparation of azoimide, HN_3, from inorganic substances; the electrolytic preparation of aluminium and magnesium; the statement that red phosphorus is crystalline, etc.

The last section of 295 pages gives a summary of the more important facts of organic chemistry. After some preliminary paragraphs upon the analysis of carbon compounds, molecular weight determination, constitutional formulas and stereochemistry, the organic compounds are taken up in the usual way. In connection with each class of compounds the general behavior and chemical characteristics of the class are discussed. In this section of the book,

as in the earlier ones, the author has endeavored to keep abreast of the times, and we find mentioned here the results of recent synthetical experiments, such as those upon the sugars; and many new substances that in recent years have become prominent because of their medicinal properties have been introduced. While the book is not intended to be a text-book in the ordinary sense, nor to serve as an introduction to the science, it can, nevertheless, be strongly recommended to all students of chemistry, who, in connection with their lecture and laboratory courses, desire to have a convenient and compact reference book—a book containing all the more important facts of general and descriptive chemistry clearly stated and provided with an excellent index. EDWARD H. KEISER.

Field, Forest and Garden Botany. A simple introduction to the common plants of the United States east of the 100th Meridian, both wild and cultivated. By ASA GRAY. Revised and extended by L. H. BAILEY. American Book Co. 1895. 8vo. pp. 519.

The first edition of this useful popular botany was issued in 1868 as a companion book to the author's 'Manual of the Botany of the Northern United States.' The present revision is planned to fill the same place as relates to the sixth edition of the 'Manual,' giving, as it does, concise descriptions of the more common native plants, and of the large number of species cultivated for use or ornament. The number of the latter category has greatly increased during the twenty-seven years which have elapsed since the first issue of the work, and as regards these the treatment is exceedingly complete. The selection of the 'common' native species has been a matter of great difficulty, and in this the book will probably be found unsatisfactory. The more usual plants of the region north of Virginia and Tennessee are for the most part included, but the Southern native flora is almost wholly omitted, so that in this respect the title is misleading. As a guide to the cultivated species it will find its greatest value. It is our opinion, however, that if the scope of the work had been restricted to the domesticated flora, and the descriptions of these plants been more fully drawn out, it would have been more generally serviceable than by treating them with the native species.

The necessity which has been felt of making the book a companion to the 'Manual' has kept up the old and unfortunate arrangement of groups which we find in that work, although we are pleased to find that the Gymnosperms have been brought into their logical position.

N. L. B.

Description des ravageurs de la vigne. Insects et champignons parasites. HENRI JOLICOEUR. 4°. Riems et Paris. 1894. Pp. viii., 236, pl. 20.

This sumptuous volume with large pages and wide margins is one of the latest contributions to the rapidly increasing literature of disease of plants. The French have always taken the greatest interest in diseases of the vine, and quite naturally, because of the extent of the industry in their country. The author of the present volume is the general secretary of the Society of Viticulture and Horticulture of Reims, and while he brings to the subject a knowledge of what various French authors have to say upon the subjects discussed, from its pages there never could be gleaned the fact that the English speaking races had ever done any work upon the various diseases. This is, perhaps, a general fault of the French, since they are so imbued with admiration for their own country that other countries hold a very subordinate place.

The work under notice is divided into two parts, one treating of parasitic ani-

mals, the other of parasitic plants. The 'animals' treated of are mainly insects, and the various orders taken up are Lepidoptera, Coleoptera, Orthoptera, Hemiptera and Arachnida. Under each of these heads the species belonging to the orders are discussed, and facts are given regarding their life history, geographical distribution, natural enemies, influence of external conditions on development, means of destruction and bibliography. The cryptogamic enemies of the vine form the subject of the second part, and we have here discussions of Oidium, mildew, anthracnose, pourridie (caused by *Agaricus melleus*), *Vibrissea hypogea*, melanose, black rot and one or two others. There are no especially new facts given in the volume as far as observed. The plates are beautifully drawn and colored and have the merit of being mainly new, only a very few figures having been copied from other authors.

J. F. James.

Icones fungorum ad usum Sylloges Saccardianæ Accommodatæ. A. N. Berlese. Vol. 2, fasc. 1, pp. 28, pl. 45.

This, the first part of a new volume of this sumptuous work, has just been published. It sustains the high character of the first volume. In it Dr. Berlese discusses the species of Saccardo's section *Dictyosporæ* of the *Sphæriaceæ*, giving diagnosis of the species of *Pleomassaria*, *Karstenula* and *Pleospora*. Only two new species are described, viz., *Pleospora parvula* on stems of *Berberis vulgaris*, and *P. magnusiana* on culms and leaves of *Glyceria vahliana*. The latter name is proposed for *P. pentamera* of Berlese's monograph, as the form is now considered distinct from Karsten's species of this name. *Pleospora carpinicola* Ell. & Ever. is transferred to the genus *Karstenula*; and *P. hysteroides* Ell. & Ever. is regarded as a sub-species of *P. andropogonis* Niessl. These are all the changes proposed, which seems quite remarkable in these days. The illustrations are excellent, and while some species seem to be perilously near others, doubtless a carefully discriminating eye would be able to separate them.

Joseph F. James.

Washington, D. C.

NOTES AND NEWS.

General John Newton, U. S. A., engineer, died on May 1, at the age of seventy-two years. He was elected a member of the National Academy of Sciences in 1876.

Dr. Karl Ludwig, professor of physiology in the University of Leipzig, died on April 27, at the age of seventy-nine years.

The *Johns Hopkins University Circular* for April contains the address made by President Low on the Nineteenth Commemoration Day, February 22. The address was entitled 'A City University,' and gives an admirable review of the scope of a great university and its relation to the city in which it is situated. After describing the different plans of the American, German, French and English university, Mr. Low continued: "The aim which the German university has set before itself and which it has very largely realized under the conditions natural to German life, is the aim, in my judgment, which the American university also should set before itself, and which it must realize under the conditions natural to American life. Because, after all has been said, the world is ruled by its thinkers, and civilization is carried forward by the patient investigators of natural laws; the lives of men are largely shaped by the teachings of experience as revealed by historic study; and the literature of men is enriched by every addition to our knowledge of the literature and language of the past. Nature's craftsmen in all these directions will produce results according to their gifts outside of a university if they get no opportunity within it. But the history

of Germany clearly shows that the opportunity to serve mankind along such lines is much enlarged if to train such men is the chosen aim of the university; in part, because, in that case, the university affords the material apparatus by the aid of which the natural thinker or investigator can best do his work, and, most of all, because, in a university so constituted, the atmosphere of the place and the spirit of the men who work there are friendly to such labors."

THROUGH the courtesy of the Assistant Secretary of the Royal Meteorological Society, we are informed that at the meeting of that Society on April 17th Messrs. A. C. Bayard and W. Marriott communicated a paper on 'The Frost of January and February, 1895, over the British Isles.' It was stated that the cold period which commenced on December 30th and terminated on March 5th was broken by a week's mild weather from January 14th to 21st, otherwise there would have been continuous frost for 66 days. Temperatures below 10° Farenheit, and in some cases below zero, were recorded in parts of England and Scotland between January 8th and 13th, while from the 26th to the 31st, and from February 5th to 20th, temperatures below 10° occurred on every day in some part of the British Isles. The coldest days were February 8th to the 10th. The lowest temperatures recorded were —17° at Braemar, and —11° degrees at Bucton and Drumlanrig. The mean temperature of the British Isles for January was about 7°, and for February from 11° to 14°, below the average, while the mean temperature for the period from January 26th to February 19th was from 14° to 20° below the average. The distribution of atmospheric pressure was almost entirely the reverse of the normal, the barometer being highest in the north and lowest in the south, the result being a continuance of strong, northerly and easterly winds. The effect of the cold on the public health was great, especially on young children and old people. The number of deaths in London due to diseases of the respiratory organs rapidly increased from February 2d to March 2d, when the weekly number was 1448, or 945 above the average. From a comparison of previous records the authors are of opinion that the recent frost was more severe than any since 1814.

THE *Popular Science Monthly* for May prints an interesting account of the naturalist Conrad Gesner, by Professor W. K. Brooks. It is illustrated by twelve photo-engravings taken from the original wood cuts in his work, *Historia Animalium*, published in the latter half of the sixteenth century.

IN the *Atlantic Monthly* for May Mr. Percival Lowell begins a series of articles on the planet Mars. He concludes that we have proof positive that Mars has an atmosphere, that the air is thinner at least by half than that on the summits of the Himalayas, that in constitution it does not differ greatly from our own, and that it is relatively heavily charged with water vapor. Professor Holden, on the other hand, in the May number of the *North American Review*, concludes from the observations on the spectrum of Mars made by Professor Campbell, and printed recently in the *Publications of the Astronomical Society of the Pacific*, that there is no more evidence of aqueous vapor nor of an atmosphere in Mars than there is in the case of the Moon.

THE American Academy of Medicine met at Johns Hopkins University on May 4th and May 6th, under the Presidency of Dr. J. McF. Gaston.

MR. HENRY SEEBOHM will write the text for a new work on the eggs of British Birds, to be published by Pawson and Brailsford, of Sheffield, England. The work will contain colored illustrations of the eggs of 400 species.

Professor F. N. Cole, now of the University of Michigan, has been appointed Professor of Mathematics in Columbia College and Barnard College, filling one of the three new chairs recently endowed in Barnard College.

Professor Franz Posepny, known for his researches on mineral deposits, died on March 27th, at the age of fifty-nine years.

The Association of Military Surgeons of the United States will meet at Buffalo, New York, on May 21st, 22d and 23d, under the Presidency of Dr. George M. Sternberg.

The twenty-second National Conference of Charities and Correction will be held in New Haven during the week beginning May 24th.

Gov. Morton has signed the bill incorporating the New York Zoölogical Society and providing for the establishment of a Zoölogical Garden in New York.

Mr. Robert Fitch, antiquarian and geologist of Norwich, England, died recently at the age of 93 years.

The death is announced of Lothar von Meyer, Professor of Chemistry at the University of Tübingen, at the age of 65.

The presidential address delivered before the recent meeting of the American Society of Naturalists by Professor C. S. Minot on The Work of the Naturalist in the World is printed in the May number of the *Popular Science Monthly*.

The tenth annual meeting of the American Association for the Advancement of Physical Education was held at the Teachers' College, New York, on April 25, 26 and 27. The program included a large number of papers of scientific interest.

Dr. Kurt Rumker has been called to a professorship of agriculture in the University of Breslau.

Commissioners are being appointed by Governor Morton with a view to the acquisition of the Hudson River Palisades by the United States.

Mr. M. S. Read, now of Cornell University, has been appointed Professor of Philosophy in Colgate University.

The departments of Mining and Geology of Columbia College will hold their annual summer school in Colorado. The School in Practical Mining will be in Central City under the charge of Professor Peele, and the Geological School will meet at Golden under the charge of Professor Kemp.

Dr. Hans Thierfelder has been appointed Director of the Chemical Department of the Physiological Laboratory in Berlin.

The Amherst Summer School of Library Economy, under the direction of Mr. William I. Fletcher, will be in session from July 1 to August 3.

The April number of the *Bulletin of the Torrey Botanical Club* contains a biographical notice of John H. Redfield by Mr. William M. Canby. There is an excellent portrait and a bibliography containing fifty-four titles.

The presidential address on 'The United States Geological Survey,' given before the Geological Society of Washington, on December 18, 1894, by Mr. Charles D. Walcott, and published in the February number of the *Popular Science Monthly*, has been reprinted. It should be in the hands of all who are interested in the great work accomplished and in progress under the direction of the United States Geological Survey.

With the permission of the Prussian Minister of Education the University of Göttingen has conferred the degree of doctor of philosophy on Miss Grace Chisholm. This is a first degree conferred on a woman since Göttingen became a Prussian university.

Professor Halsted writes to *Garden and Forest* that the late winter has been very

trying upon the English Ivy which covers many of the older buildings in New Brunswick, New Jersey. The leaves are mostly brown, many of them dead, and have the appearance of having been scorched by fire. It may be that the plants will revive with warm weather, but these old vines, which have been the pride of the city, are just now anything but attractive.

SOCIETIES AND ACADEMIES.

BIOLOGICAL SOCIETY OF WASHINGTON.

AT the meeting of April 20 Dr. Frank Baker exhibited specimens and gave descriptions of two anomalous forms of human lumbar vertibræ hitherto undescribed.

Dr. Theobald Smith read a paper entitled 'An Infectious Entero-hepatitis of Turkeys, Caused by Protozoa.'

The first intimation of the existence of this hitherto unrecognized disease was given by some diseased organs sent by Mr. Samuel Cushman of the Rhode Island Experimeet Station in 1893. In 1894 the speaker had an opportunity of studying a number of cases in various stages of the disease.

This begins in the cæca and manifests itself by a more or less uniform thickening of the wall. When this has continued for some time an exudate is poured out from the mucous membrane, which coagulates firmly and occludes the tube itself more or less completely. The cause of the thickening of the cæcal wall is a protozoon from 6 to 10 μ in diameter, which multiplies very rapidly within the connective tissue interstices of the mucous and submucous tissue. The irritation produced by these bodies induces proliferation of the connective tissue cells. The thickening is further increased by cell infiltration, due to inflammatory processes which appear later on, and which may be due to the absorption of bacterial products from the denuded mucosa.

In almost every case the liver is secondarily and usually very severely involved by the transportation of these protozoa from the seat of the disease in cæca through the portal system. The liver becomes covered with round isolated and confluent patches of a yellowish or brownish color, which represent necrotic foci in the substance of the liver itself. Within these, in the earlier stages, large numbers of the same protozoa may be found.

The protozoon, as stated above, is a spherical or slightly oval body, of a homogeneous appearance and containing an exceedingly minute ring-like nucleus. It has shown none of the characters of sporozoa. Its rapid multiplication within the tissue spaces, where it may be seen either isolated or in groups of two, three, four or many individuals, as well as the absence of any intercellular stage, has induced the writer to place it, at least provisionally, in the genus Amœba, and, in consultation with Dr. Stiles, to denominate it *Amœba meleagridis*. A detailed account of this investigation is to appear in a forthcoming bulletin of the Bureau of Animal Industry.

Dr. G. Browne Goode read a paper on 'The Horizontal and Vertical Distribution of Deep Sea Fishes.' The paper had for its object to demonstrate that the accepted ideas in regard to the distribution of deep sea fishes, having been founded on incomplete data, are erroneous; and that, contrary to the commonly accepted opinion, no separation of deep sea fish life into horizontal strata is possible. On the other hand, the idea that the fish fauna of the depths of the sea is the same in all parts of the world is without foundation.

Through the application of a percentage method eleven well marked faunal regions were shown to exist, as well as two subregions. The regions proposed were as follows:

1. Boreal Atlantic.
2. Eastern Atlantic or Lusitanian, with a Mediterranean sub-region.

3. Northwestern Atlantic or Virginian, with a Caribbean-Mexican sub-region
4. Southwestern Atlantic or Brazilian.
5. Boreal Pacific or Aleutian.
6. Eastern Pacific or Galapagean.
7. Northwestern Pacific or Japanese.
8. Polynesian.
9. Zealandian.
10. Antarctic.
11. Indian.

M. B. Waite,
Recording Secretary.

BOSTON SOCIETY OF NATURAL HISTORY.

The annual meeting was held on Wednesday, May 1st.

A paper was read by Mr. J. L. Tilton *On the Geology of the Southwestern part of the Boston Basin.*

Reports of the officers were received and officers for 1895–6 were elected as follows:

President, William H. Niles.

Vice-Presidents, Nathaniel S. Shaler, William G. Farlow, Charles P. Bowditch.

Curator, Alpheus Hyatt.

Secretary, Samuel Henshaw.

Treasurer, Edward T. Bouvé.

Librarian, Samuel Henshaw.

Councillors for Three Years, Hermon C. Bumpus, Charles B. Davenport, William A. Jeffries, George G. Kennedy, Augustus Lowell, Miss Susannah Minns, Thomas A. Watson, Samuel Wells.

Samuel Henshaw,
Secretary.

SCIENTIFIC JOURNALS.

AMERICAN JOURNAL OF SCIENCE, MAY.

James Dwight Dana.

Color Relations of Atoms, Ions and Molecules: By M. C. Lea.

Further Notes on the Gold Ores of California: By H. W. Turner.

Some Relations between Temperature, Pressure and Latent Heat of Vaporization: By C. E. Linebarger.

Double Halides of Cæsium, Rubidium, Sodium and Lithium with Thallium: By J. H. Pratt.

Argon, Prout's Hypothesis, and the Periodic Law: By E. A. Hill.

Improved Rock Cutter and Trimmer: By E. Kidwell.

Relation of the plane of Jupiter's orbit to the mean-plane of four hundred and one minor planet orbits: By H. A. Newton.

Chemistry and Physics; Geology; Miscellaneous Scientific Intelligence; Obituary.

BULLETIN OF THE TORREY BOTANICAL CLUB, APRIL.

Notes on Some Florida Plants: Geo. V. Nash.

John H. Redfield: Wm. M. Canby.

A Fossil Marine Diatomaceous Deposit at St. Augustine, Florida: Charles S. Boyer.

New Species of Parastic Fungi: S. M. Tracy and F. S. Earle.

The Systematic Botany of North America; Botanical Notes; Proceedings of the Club; Index to Recent Literature Relating to American Botany.

AMERICAN JOURNAL OF CHEMISTRY, MAY.

On the Two Isomeric Chlorides of Orthosulphobenzoic Acid: Ira Remsen.

I. The Action of Aniline and of the Toluidines on Orthosulphobenzoic Acid and its Chloride: Ira Remsen and C. E. Coates, Jr.

II. Further Study of the Action of Aniline on the Chlorides of Orthosulphobenzoic Acid: Ira Remsen and E. P. Kohler.

III. Separation of the Two Chlorides of Orthosulphobenzoic Acid: Ira Remsen and A. P. Saunders.

The Sugar of the Agave Americana: W. E. Stone and D. Lotz.

The Law of Mass Action: J. E. Trevor.

Chromates of the Rare Earths: Chromates of Thorium: Chase Palmer.

On a New Method for the Separation of Copper and Cadmium in Qualitative Analysis: Allerton S. Cushman.

Reviews.